

## COLLEGE RANKING

(Multi-parameter problem solving)

### **Focus:**

In this lab, you will produce a one-dimensional solution to a multi-dimensional problem.

### **Overview:**

An important aspect of engineering is that a typical problem does not have one definite solution. Further, the problem often involves several parameters that can be varied in many different ways. In manipulating these parameters, one often finds that a trade-off exists among them. In other words, improving one parameter often means causing another to suffer. Considering this, it is easy to see how several good “solutions” may exist for a particular problem. Each solution depends a great deal on the approach and discretion of the engineer.

For example, when engineering firms submit proposals, no two will be alike, and there is no single measure of which is best. Which is chosen depends on which dimensions of the problem are considered most important. Factors such as cost, reliability, time, politics, and community concern often work at cross-purposes.

### **Procedure:**

Attached is a list of hypothetical colleges, and 12 pieces of data on each:

1. academic reputation (based on a survey of college presidents)
2. percentage of students who had been in the top 10% of their high school class
3. SAT/ACT scores, the 25<sup>th</sup> to 75<sup>th</sup> percentile range
4. acceptance rate
5. yield (the percentage of those admitted who decide to attend)
6. educational expenditure per student
7. student to faculty ratio
8. percentage of courses in which there are 50 or more students
9. percentage of alumni who donate money to the college
10. percentage of freshman who return sophomore year
11. 1995 graduation rate
12. the 1995 graduation rate the college predicted

Your task is to devise a ranking system that will reflect what you consider most important in a college. To do this, you will have to decide how to weight each of the 12 criteria you have data on. Since the data comes in several formats (numbers, ratios, ranges), you will have to convert it into a form that can be inserted into a single equation.

Keep in mind that you do not have to assign equal weighting to the entire range of data *within* a category. The number, whether it be a ranking or quantity, that represents a particular school's score on a particular variable is only a metric allowing it to be compared with other schools. Sometimes the data may, if used as a given, apply a sharper distinction within a category than is necessary or relevant. For example, is a college that spends \$60,000 per student doing fully twice as much as one that spends \$30,000? If you think not, you could simply divide the list into several groups on this criterion, and assign weights by group. This way, you could make the differentiation on a certain factor less sharp.

There is a similar problem to deal with if you choose to convert all the categories to rankings: the real difference between, for example, yields of 75%, 69%, 49%, and 48% is badly represented by a simple conversion to 1, 2, 3, 4, since a 20-point gap and 1-point gap are treated as equal. Again, one solution would be to group schools whose scores on this criterion fall within a certain proximity.

In assigning weights, also consider which categories of data are factual or opinion-based.

**Write-up:**

Turn in:

1. A printout of your Excel spreadsheet, including final "scores" and ranking for each college. Make sure all columns are adequately labeled.
2. An explanation of your formula. How did you compute the final scores for the ranking, and why did you weight the data as you did?
3. A graph (created in Excel) which best displays your evaluation.

	Acade- mic Rep.	Students from top 10%	SAT/ACT 25th-75th Percentile	Accept. Rate	Yield	Expenditure per Student	Student/ Faculty Ratio	Classes of 50+	Alumni Giving Rate	Freshman Retention Rate	1995 Grad. Rate	Predicted Grad Rate
Benedict Arnold U.	30	82	1230 - 1410	39	49	\$15,874	13/1	13	50	97	94	81
Cal Ripken Tech	18	85	1260 - 1530	26	38	\$25,878	8/1	9	43	95	89	92
Diplomas-R-US	1	92	1340 - 1550	14	60	\$32,417	8/1	13	62	97	95	93
Duchess	7	81	1250 - 1440	34	45	\$22,285	13/1	11	20	95	89	87
Emory Board U.	11	83	1270 - 1440	33	48	\$32,022	6/1	16	38	95	87	87
Fly-by-Night U.	11	87	1290 - 1470	29	40	\$31,652	14/1	7	41	96	95	90
Hall Institute	3	92	1370 - 1560	12	75	\$42,902	12/1	21	48	96	97	97
Karweit Kollege	3	87	1330 - 1530	19	55	\$36,643	13/1	14	31	97	93	97
Koresh Divinity School	7	97	1400 -1580	27	43	\$73,967	6/1	5	36	94	85	99
Londontown U.	7	76	1280 - 1460	43	26	\$61,704	14/1	11	37	94	87	88
Mr. Roger's University	11	81	1260 - 1440	40	38	\$29,760	12/1	10	23	96	90	82
North-Northwestern U.	24	67	1180 - 1380	56	23	\$54,020	10/1	7	94	94	85	81
Offshore U.	11	88	1330 - 1520	23	46	\$31,491	10/1	13	42	97	94	90
Pilaf U.	30	81	1230 - 1390	51	26	\$30,163	14/1	7	91	91	90	82
Smartmouth	24	64	1220 - 1370	58	30	\$25,490	13/1	5	91	91	83	77
Virginia Macho Inst.	3	95	1350 - 1550	20	54	\$45,507	9/1	9	45	98	95	94
Votre Dame	11	84	1341 - 1438	24	43	\$32,738	18/1	9	27	95	88	86
Wawa Institute	3	74	1270 - 1470	71	31	\$40,686	7/1	5	47	91	86	89
Whattsamatta U.	1	97	1380 - 1540	27	53	\$37,376	10/1	12	42	97	89	95
Zanvyl Hopkins	11	86	1290 - 1470	21	48	\$23,889	13/1	13	39	96	93	87